

## SUMMARY

Regions of function space having one dimension (curved line) and two dimensions (curved surface) are easily represented in the function-space diagram by a family of curves having one or two parameters, respectively. In any 3-space projection they appear as a curved line or curved surface.

Any figure having more than three dimensions is of course difficult to represent in a space of three dimensions. The problem is like that of representing a solid figure on paper. Three methods have been illustrated, namely:

1. The projected outline of the figure.
2. The projected sections or contours.
3. The projected density.

A fourth method commonly used in descriptive solid geometry is that of the illuminated and shaded surface. While this method often gives the most clearly readable representation of solid figures, its application to function space is questionable, since the laws of illumination and reflection are not known for more than three dimensions.

ZOOLOGY.—*A review of the subspecies of the indigo snake* (*Drymarchon corais*).<sup>1</sup> HOBART M. SMITH, Smithsonian Institution. (Communicated by HERBERT FRIEDMANN.)

In the most recent study of *Drymarchon* (Amaral, Mem. Inst. Butantan 4: 323-330, 1929), three subspecies of the monotypic genus are recognized: *corais corais*, *corais melanurus*, and *corais couperi*. The last named is stated to range "from northeastern Mexico to southeastern United States." As has been shown by Blanchard (Papers Michigan Acad. Sci., Arts and Lett. 4: 28, 1925), and accepted by Stejneger and Barbour (Check List N. Amer. Amph. Rept., ed. 4, pp. 106-107, 1939), the form in Florida and Georgia possesses characters in both coloration and scutellation that differentiate it from any other population of the genus; and to this form must be applied the name *couperi*, with type locality in Georgia. Present records further demonstrate that there is a hiatus between the range of *couperi* and that of the *Drymarchon* of Texas, this hiatus occurring in the region of Louisiana, eastern Texas, and Mississippi.

Amaral (*op. cit.*) indicates that the area of intergradation between his composite *couperi* and his *melanurus* of Central America and central Mexico may occur in the region of Tamaulipas and Veracruz. Since it can be demonstrated that the southwestern Texas form of

<sup>1</sup> Received April 10, 1941.

*Drymarchon* is not *couperi*, the identity of the forms that are inferred to intergrade in Mexico is left in doubt.

This confusion has led to a reexamination of specimens in the U. S. National Museum and in the EHT-HMS collection and to an attempt to redefine the various forms of the genus. In the United States and South America the problem seems relatively simple, as only two well-defined forms in each area are represented by specimens examined. In Mexico and northern Central America, however, the problem becomes complicated. Five of the seven recognizable forms occur in this area. Lack of adequate material of certain subspecies has hampered a ready understanding of the variation and distribution of all forms. Most difficult to handle of all are the young, which are frequently unidentifiable. With more material, accompanied by specific locality data, probably the difficulties encountered in separating the young may be eliminated. The young of three forms are definitely identifiable, through their peculiar scutellation or coloration, or both. Those of the other four forms can be separated into two groups, but association with either one of the two subspecies in each group is now too vague to be reliable—other than by geographic probability.

I am indebted to Dr. E. H. Taylor for his suggestions and loan of material during the course of this study, which was begun some time ago at the University of Kansas. An important portion of the material utilized was collected and studied during my tenure of the Walter Rathbone Bacon Traveling Scholarship of the Smithsonian Institution.

#### KEY TO THE FORMS OF DRYMARCHON

1. Belly and tail light throughout their length; no *distinctive* dark marks on edges of subocular labials; in adults, anterior portion of body darker than posterior portion and tail.....*corais corais*  
Tail and at least posterior part of belly usually dark (black); if not, distinctive dark marks present on edges of at least subocular labials... 2
2. Antepenultimate labial separated from temporals by contact of adjacent supralabials; all black except chin and sometimes a few areas on supralabials; caudals less than 68; ventrals 185 to 189 in males, 193 to 195 in females.....*corais couperi*  
Antepenultimate labial in contact with temporals or lower preocular, or both..... 3
3. Subcaudals less than 68 (55 to 65); ventrals 193 or less; scale rows usually 14 near anus.....*corais erebennus*  
Subcaudals more than 68 (69 to 83); scale rows usually 15 near anus.... 4
4. Anterior portion of body light brown, extreme posterior portion and tail black; three vertical black streaks on posterior edges of subocular labials, and one on posterior edge of seventh labial, never any on preocular labials (either above or below); lateral gular scales never black-tipped; young lighter anteriorly than posteriorly, like adults, but with very broad, light, chevron-shaped bands covering two scale lengths....  
.....*corais melanocercus*

- Entire body and tail light brown above, or all black; light bands in young specimens narrow, covering about one scale length (?) . . . . . 5
5. Entire body brown above, and no darker posteriorly than anteriorly; ventral surface of tail and posterior portion of body dark, but not black; young (and some adults) with distinct, longitudinal, short black streaks on anterior part of body . . . . . *corais unicolor*
- Entire body nearly uniform black above; belly black on posterior portion, subcaudal surface black . . . . . 6
6. Light areas on supralabial region white or cream, very sharply defined from the black borders; anterior portion of belly mostly light, salmon pink in color . . . . . *corais rubidus*
- Most of head, including sides, black; most of belly black, the light portions cream or white, not reddish . . . . . *corais orizabensis*

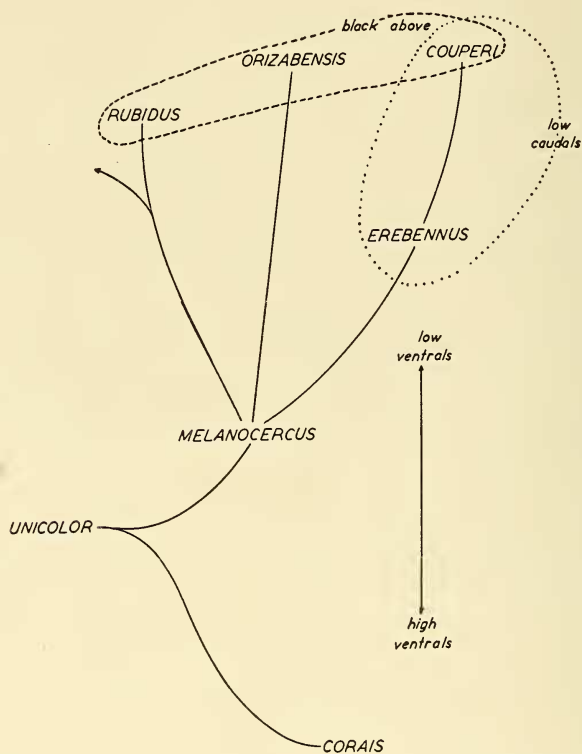


Fig. 1.—Possible phylogeny of the subspecies of *Drymarchon corais*.

Evolution within the genus may be traced by the general trend toward melanism in end forms, as in *couperi*, *rubidus*, and *orizabensis*. Accordingly a form that is the least melanistic is indicated as the more primitive; this form is *unicolor*. The geographically centralized position of *unicolor* in relation to others supports the premise that it is the most primitive. Evolution has proceeded in two directions from this common ancestor, both geographically and in pattern. In one direc-

tion, toward the south, evolved *corais*, now restricted to South America. This branch exemplifies a different trend in pigmentation than does the other branch—progression of melanism from the cephalic region toward the tail. The trend in the second branch is from the tail toward the head. In both branches pattern evolution is directed toward an end form completely black in color.



Fig. 2.—Distribution of the subspecies of *Drymarchon corais*.  
Base map courtesy McKnight and McKnight.

The fact that *unicolor* is now widely separated from *corais* by *melanocercus* in Costa Rica, Panama, and northern South America does not prove the former could not have given rise to *corais*. It is very unlikely that, once the tail-head tendency of pattern change was established in *melanocercus*, it should be reversed to produce the characters now shown by *corais*.

Development of other forms in the genus appears to have proceeded solely from *melanocercus*. While *unicolor* extends a considerable distance toward the north on the Pacific slope, it is separated from *melanocercus* the whole distance by the central mountain ranges. Near the Isthmus, however, where the mountain ranges are lower and complete connection between the Atlantic and Pacific coast populations is possible, the two forms again come in contact, but the more plastic of the two (*melanocercus*) has changed, as in this region it is intergrading with *rubidus* of northern Pacific slopes; perhaps because of this change in *melanocercus* there is no mingling of *unicolor* with it in this area; the two live in the same general region in southern Chiapas, and the ranges may overlap to a still greater extent than now known.

It is apparent, then, that it was *melanocercus*, not *unicolor*, that gave rise to *rubidus*. The *rubidus* stem produced no further subspecies, except perhaps one on the Tres Marias Islands.

On the Atlantic coast *melanocercus* gave rise to another color phase (*orizabensis*) very much like *rubidus*; these two are conceived as parallel developments not derived one from the other. Still farther north *melanocercus* gave rise to *erebennus*; and presumably the latter to *couperi*, since these two hold in common a caudal count lower than that of other forms.

It should be observed that all three end forms (*rubidus*, *orizabensis*, *couperi*) of the *melanocercus* branch of *Drymarchon* (as opposed to the *corais* branch) are very black; two of them (*orizabensis*, *couperi*) are practically uniform black; and one of them (*couperi*) not only has reached the ultimate stage in color evolution in the genus, but is by far the most highly modified in scutellation. The expectation, of course, is that the *corais* branch should possess one or more black subspecies; if they exist, however, they are not yet known.

***Drymarchon corais unicolor* subsp. nov.**

*Holotype*.—U.S.N.M. no. 110865, female, from La Esperanza, near Escuintla, Chiapas.

*Paratypes*.—U.S.N.M. nos. 6757A-B, "Guatemala"; no. 12687, Escuintla, Guatemala; no. 79960, Managua, Nicaragua; no. 46464, Huehuetan, Chiapas; no. 30424, "Tehuantepec"; and EHT-HMS (HMS 14556) from Colonia Hidalgo, 8 kilometers north of La Esperanza, Chiapas.

*Diagnosis*.—Adults uniform light brown above, posterior portion no or little darker than anterior, sometimes longitudinal black streaks anteriorly; venter light, becoming somewhat darker posteriorly and under tail, but not black; young with short, black streaks anteriorly, posteriorly with narrow, irregular, light crossbars. Ventrals 192 to 206; caudals 70 to 77 (females); totals 266 to 281 (females). Antepenultimate labial in contact with temporals of postoculars, or both; scale rows posteriorly usually 15.

*Description of holotype*.—Head scales normal; supralabials eight, the sixth in contact with lower anterior temporal; infralabials nine, first five in contact with chin shields, four in contact with anterior chin shields; one pre-ocular, two postoculars; temporals in two rows, three in lower row, two in upper; lower posterior temporal narrowly in contact with parietal on one side (between the two upper temporals), narrowly separated on the other; posterior chin shields distinctly shorter and smaller than anterior; ventrals 195; anal entire; caudals 71. Total length 1570 mm; tail 320 mm.

Dorsal surface of entire body and tail uniform light brown, with the exception of irregular, short, poorly defined, diagonal black streaks on anterior portion of body; a black, diagonal patch on nape, poorly defined and short. Sides of head light brown, as dorsal surface; a vertical black mark on the posterior edge of the fourth to the seventh supralabials, and on the corresponding infralabials; posterolateral gular scales darker at their tips.

Belly light anteriorly, posterior fifth becoming brown, as subcaudal surface; no portion of belly or tail black, save a very few marks on the edges of some ventrals.

*Variation*.—The paratype series compares well with the holotype in coloration. In one the dark streaks are more prominent. In none is the posterior portion of the belly, or the subcaudal surface, black.

TABLE 1.—SCALE COUNTS IN UNICOLOR

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
6757	♂	206	68 +	17-15	8-8	Contact
6757	♀	204	77	17-15	8-9	Contact
30424	♀	192	75	17-15	8-8	Contact
12687	♀	199	71	17-15	8-8	Contact
46464	♀	200	70	17-15	8-8	Contact
79960	♀	204	75	17-15	8-8	Contact
110865	♀	195	71	17-15	8-8	Contact
14556	♀	200	52 +	17-15	8-8	Contact

*Remarks*.—Almost certainly this form intergrades with *melanocercus* in southern Nicaragua or northern Costa Rica. The Managua, Nicaragua, paratype is fairly typical, however. North of Nicaragua the two forms do not intergrade, as they are separated by continuous, high ranges of mountains except toward the Isthmus of Tehuantepec. Here they do not intergrade, either, as typical *unicolor* occurs at La Esperanza, Chiapas, with *melanocercus-rubidus* intergrades. An ecological segregation of the two types at La Esperanza is indicated. The single intergrade secured there (No. 110874) as well as two intergrades from Tonalá, Chiapas (Nos. 110875-6) were found in the forested hills, while the two *unicolor* collected near La Esperanza were found on the coastal plain. Presumably the latter subspecies occurs still farther north in the same habitat. Unfortunately no specimens are known from the coastal plain between the vicinity of Tehuantepec and La Esperanza.

The *rubidus-melanocercus* intergrades are further discussed in the description of the former subspecies.

**Drymarchon corais corais (Boie)**

*Coluber corais* Boie, Isis, 1827, p. 537; Schlegel, Essai Phys. Serp. 2: 139-141, pl. 5, figs. 9, 10. 1837.

*Geoptias flaviventris* Steindachner, Sitzb. Akad. Wiss. Wien 55: 271, pl. 4, figs. 4-7. 1867 (Matogrosso, Cuyaba und dem Rio Vaupe).

*Spilotes corais suborbitalis* Peters, Monatsb. Preuss. Akad. Wiss., Berlin, 1868: 641 (Caracas, Venezuela).

*Spilotes corais xanthurus* Brown, Proc. Acad. Nat. Sci. Philadelphia, 1893: 433 (type locality unknown; not Veracruz, as suggested).

*Drymarchon corais corais* Amaral, Mem. Inst. Butantan 4: 325-327, pl. 1929.<sup>2</sup>

*Type locality*.—America.

*Diagnosis*.—Adults dark anteriorly, light posteriorly on back; belly and subcaudal surface white, except edges (lateral); young no darker anteriorly

TABLE 2.—SCALE COUNTS IN CORAIS

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
5579	♀	208	72	17-15	8-8	Contact
5579	♀	209	75	17-15	8-8	Contact
11309	♀	210	—	17-15	8-8	Contact
12535	♂	205	83	17-15	8-8	Contact
15233	♂	202	80	17-15	8-8	Contact
60660	♂	—	79	17-15	8-8	Contact
60749	♂	206	82	17-15	8-8	Contact
66871	♀	210	74	17-14	8-8	Contact
84523	♀	205	74	17-15	8-8	Contact

than posteriorly, but with more or less chevron-shaped, broad, light bands, not interrupted and covering about two scale lengths; supraocular labials not distinctively black-edged (see below) in young or adult. Ventrals 190 (?) to 217 (males 190 to 210, females 205 to 217); caudals 72 to 84 (72 to 84 in males, 72 to 78 in females); total counts 272 to 292 (males 272 to 292, females 278 to 291). Antepenultimate labial in contact with temporals or postoculars or both; scale rows posteriorly usually 15.

*Range*.—"Northern Argentina, Paraguay, Bolivia, tropical Brazil, eastern Ecuador and Peru, the Guianas, Venezuela, Trinidad and Tobago" (Amaral, *loc. cit.*).

*Specimens examined*.—Ten, all in the National Museum: Nos. 5579A-B, 12535, 15233, Trinidad; nos. 60660, 60749, Santa Ana, Peru; nos. 66871, Moengo, Surinam, Dutch Guiana; no. 84523, Pomeroun, 70 miles from Georgetown, British Guiana; no. 11309, Brazil; no. 100756, Terenos, Matto Grosso, Brasil.

*Remarks*.—The body coloration of adults of this form is not duplicated in any other subspecies of the genus. Most distinctive is the white belly and

<sup>2</sup> *Phrynonax angulifer* Werner, included by Amaral (*op. cit.*, p. 325) in the synonymy of *corais*, does not seem to belong to this genus. It is said to have 21 scale rows; 224 ventrals; fourth, fifth, and sixth labials in contact with the eye; and the nine median scale rows keeled.

subcaudal surface, combined with a light dorsal surface on tail and posterior part of body. Also very strikingly different from other subspecies is the absence of distinctive dark marks on the posterior edges of the subocular labials. These are very characteristic of other subspecies (unless the whole top and side of head is black), but in *c. corais* are absent, although the edges of all dorsal and lateral head scales may be black; or the whole top of the head may be black, the color extending a little below the eye.

In addition to the data afforded by the 10 National Museum specimens, ventral and caudal counts of 44 others, given by Amaral (*loc. cit.*), have been available for establishing the limits of variation in these two characters.

***Drymarchon corais melanocercus* nom. nov.**

*Spilotes melanurus* Duméril and Bibron, Erp. Gén. 7: 224. 1854.

*Geophytas collaris* Steindachner, Sitzb. Akad. Wiss. Wien 55: 271, pl. 3, figs. 4-7 (Brazil). 1867.

*Drymarchon corais melanurus* Stejneger and Barbour (part), Check List N. Amer. Amph. Rept., ed. 2: 94. 1923—Amaral, Mem. Inst. Butantan 4: 325, 330 (part). 1929.

*Type locality*.—"Mexico."

*Diagnosis*.—Adults light brown anteriorly, dark (black) on posterior fourth or fifth of body and on tail, both above and below; young generally a little lighter anteriorly than posteriorly, the bands (where visible, usually toward middle of body) similar to those of young *c. corais*; black marks on subocular labials very sharply defined, rest of head very light; no black marks on labials preceding orbit, nor on lateral gular scales; diagonal black mark on each side of neck very well defined. Ventrals 191 to 214 (males 191 to 208, females 197 to 214); caudals 71 to 88 (males 71 to 88, females 71 to 80); totals 262 to 296 (males 272 to 296, females 268 to 279). Antepenultimate labial in contact with temporal or postocular or both; scale rows usually 15 posteriorly.

*Range*.—Pacific slopes of Peru and Ecuador; northern Colombia; Central America north to northern Veracruz on the Atlantic side, to southern Nicaragua on the Pacific side.

*Specimens examined*.—Fourteen. One in the EHT-HMS collection (no. 11636) is from Mérida, Yucatán. The remainder, in the National Museum; are from VERACRUZ: Mirador? (no. 25093). CHIAPAS: Palenque (no. 110871); TABASCO: Tenosique (no. 110870). YUCATÁN: Chichen Itza (no. 46393); Yucatán (no. 6554). GUATEMALA (Petén): Pacomon (no. 71371); Piedras Negras (nos. 110872-3). COSTA RICA (no. 61947). PANAMÁ (no. 53629): Washington Station (no. 8393). COLOMBIA: Cayo Papoyal, Bolivar Dist. (no. 54338). ECUADOR (no. 14025).

*Remarks*.—This subspecies is remarkably well defined and uniform in character of color pattern throughout its entire range from South America to central Mexico. It presumably intergrades with *unicolor* in southern Nicaragua; intergradation elsewhere with it seems impossible (see discussion of latter). Intergradation with *orizabensis*, *rubidus*, and *erebennus* is actually demonstrated, however, by specimens now available (see discussions of each form).

In addition to the data afforded by the 14 specimens examined, ventral and caudal counts of nine others, given by Amaral (*loc. cit.*), have been available. The ventral, caudal, and total counts of these specimens indicate that two subspecies may be involved, although they do not seem separable on the

basis of color characters. One population is represented by specimens from Mexico and Petén, Guatemala, the other by specimens from Costa Rica south. Unfortunately no material is available from the intermediate area. The counts thus segregated are as follows:

	Northern		Southern	
	Males	Females	Males	Females
Ventrals	191-202 [3]	197-202 [4]	203-208 [8]	204-214 [6]
Caudals	71-80 [2]	71-77 [4]	77-88 [8]	73-80 [5]
Total	262-278 [2]	268-279 [4]	280-296 [8]	279-294 [4]

More specimens will be necessary to demonstrate whether these apparent differences are real. In each area there appears to be a general trend toward higher counts to the south, lower counts to the north.

TABLE 3.—SCALE COUNTS IN MELANOCERCUS

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepectoral labial	Locality
25093	♂	191	71	17-15	—	Contact	Veracruz
11636	♂	198	80	17-15	8-8	Contact	Yucatán
6554	♀	197	76+	17-15	8-8	Contact	Yucatán
46393	♀	200	77	17-15	8-8	Contact	Yucatán
110871	♂	202	71+	17-15	8-8	Contact	Chiapas
110870	♀	198	71	17-15	8-8	Contact	Tabasco
110872	?	197	77	17-15	8-8	Contact	Petén
110873	♀	202	71	17-14	8-8	Contact	Petén
71371	♀	199	74	17-15	8-8	Contact	Petén
61947	♂	205	83	17-15	8-8	Contact	Costa Rica
53629	♀	209	80	17-15	8-8	Contact	Panamá
8393	♂	203	83	17-15	8-8	Contact	Panamá
54338	?	—	80	—15	8-8	Contact	Colombia
14025	♀	207	—	17-15	8-8	Contact	Ecuador

The name *Spilotes melanurus* Duméril and Bibron is not available for this subspecies, since it was suppressed by Gray (Cat. Snakes Brit. Mus., 1858, p. 97), who placed in the same genus (*Spilotes*) *Coluber melanurus* Schlegel (1837). Gray recognized *Spilotes melanurus* (Schlegel) and treated Duméril and Bibron's name as a variety ("Var. 1") of *Spilotes corais*. The only other name which has been applied to this subspecies (*Geophytas collaris* Steindachner) is also suppressed as a secondary homonym of *Coluber collaris* Ménétr., 1832 (= *Contia collaris*), since Boulenger (Cat. Snakes Brit. Mus. 2: 31. 1894.) included Steindachner's name in the synonymy of *Coluber corais* Boie.

#### *Drymarchon corais rubidus* subsp. nov.

*Holotype*.—U.S.N.M. no. 46430, female, from Rosario, Sinaloa, collected by Nelson and Goldman.

*Paratypes*.—Twenty-one, including U.S.N.M. no. 46588, San Sebastián, Jalisco; no. 24683, Maria Madre Island, Tres Marias Islands; no. 46538, Acapulco, Guerrero; nos. 61948-9, Colima; no. 110877, San Diego, near Tehuacán, Puebla; nos. 30425, 110878-84, vicinity of Tehuantepec, Oaxaca; no. 110885, Ixtepec (San Gerónimo), Oaxaca. EHT-HMS no. 5405, Puente de Ixtla, Morelos; no. 5400, Magdalena, Jalisco; nos. 5331, 5406, El Sabino, Michoacán; no. 5591, Huajintlán, Guerrero; and no. 21514, "Guerrero."

*Diagnosis*.—Dorsal surface, including top of head, uniformly black in

adults; extreme posterior portion of belly and subcaudal surface black; remainder of belly salmon pink, except for lateral black marks; most of labials black-edged posteriorly, the rest of labial area white or pink, sharply differentiated from the black areas. Ventrals 190 to 203, caudals 69 to 78, totals 262 to 275. Antepenultimate labial in contact with temporal or postocular or both; scale rows posteriorly usually 15.

*Description of holotype.*—Head scales normal; supralabials eight, the sixth in contact with temporal; infralabials nine, five in contact with chin shields, four with anterior chin shields; latter a little shorter and wider than posterior chin shields; one preocular; two postoculars; temporals 2-2; ventrals 193; anal entire; tail tip missing. Total length 973 mm, tail 151 mm (incomplete).

Nearly uniform black above, a little lighter posteriorly; sides of head, as well as top, black, to below eye; posterior borders of all supralabials black, remainder of labial area white, sharply differentiated from black borders; scales in posterolateral gular area black-tipped. Ventral surface of tail and extreme posterior portion of belly black; remainder of belly light, with a slight reddish tinge, except for a black mark on the posterolateral edge of almost every ventral.

*Variation.*—There is little variation in coloration in the twenty paratypes. Larger specimens are quite uniform black above (type a little lighter posteriorly). Specimens in life have a distinctly salmon-colored belly.

TABLE 4.—SCALE COUNTS IN RUBIDUS

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
5331	♂	198	76	17-15	8-8	Contact
5400	♂	190	72	17-15	8-8	Contact
5405	♀	201	69+	17-15	8-8	Contact
5406	?	—	—	—	—	Contact
5591	♀	194	70	17-15	8-8	Contact
21514	♀	197	—	17-15	8-8	Contact
24683	♂	203	82	17-15	8-8	Contact
30425	♀	194	73	17-15	8-8	Contact
46430	♀	193	—	17-15	8-8	Contact
46538	♂	197	77	17-15	8-8	Contact
46588	♂	191	69+?	17-15	8-8	Contact
61948	♂	190	—	17-15	8-8	Contact
61949	?	198	—	17-14	8-8	Contact
110877	♂	196	73	17-15	8-8	Contact
110878	♂	191	72	17-15	8-8	Contact
110879	♂	197	75	17-15	8-8	Contact
110881	♂	192	76	17-15	8-8	Contact
110880	♀	195	67+	17-15	8-8	Contact
110882	♀	197	74	17-15	8-8	Contact
110885	♂	192	75	17-15	8-8	Contact
110883	♀	195	—	17-14	8-8	Contact
110884	♂	197	78	17-15	8-8	Contact

In scutellation the series is uniform with the exception of the Tres Marias Island specimen, which, like certain other snakes on the same Islands, differs from its mainland relatives by having a higher number of ventrals and caudals. It is a male, with 203 ventrals and 82 (+?) caudals; the highest mainland counts are 201 ventrals in a female (highest male count 198), and 78 caudals in a male. If further specimens from the islands consistently have high counts, they should be recognizable as belonging to a different subspecies.

*Remarks.*—The uniformly dark dorsal coloration, white or pink labial areas and high caudal count separate this subspecies from all others.

Seven specimens represent intergrades between *rubidus* and *melanocercus*. They are from "Tehuantepec" (no. 61959); El Barrio, Oaxaca (no. 30526); Santa Efigenia, Oaxaca (no. 46496); Tonalá, Chiapas (nos. 110875–6); La Esperanza, Chiapas (no. 110874); and Valley of Comitán, Chiapas (no. 46587). Three of these specimens—those from Tonalá and La Esperanza—are adults, and definitely are intermediate in character between *rubidus* and *melanocercus*.

TABLE 5.—SCALE COUNTS IN MELANOCERCUS-RUBIDUS INTERGRADES

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
30526	♀	192	76	17–14	8–8	Contact
46496	♀	196	70	17–15	8–8	Contact
46587	♀	193	—	17–15	8–8	Contact
61959	♂	199	73	17–15	8–8	Contact
110874	♀	202	79	17–15	8–8	Contact
110875	♀	193	73+	17–15	8–8	Contact
110876	♂	193	71	17–15	8–8	Contact

They are distinctly lighter anteriorly than posteriorly (not so light as in *melanocercus*); the tail is jet black; the labial marks are less numerous than in *rubidus*, restricted to the subocular and postocular labials (as in *melanocercus*); the light areas of the lips are dull brown (not white as in *rubidus*); the posterolateral gular scales have slightly darker tips; and the belly is little marked with black anteriorly (as in *melanocercus*). These characters are definitely intermediate between those of *rubidus* and *melanocercus*, and cannot be construed as indicating intergradation between either one of these and *unicolor*. In fact, that such intergradation does not occur is indicated by the existence of *rubidus-melanocercus* intergrades at La Esperanza with typical *unicolor*.

The other four specimens unfortunately are juveniles, and accordingly cannot definitely be assigned to the category in which they are here placed as *rubidus-melanocercus* intergrades. They are tentatively referred to this category because of an apparent combination in them of the characters of the two forms, and because of geographic probability. One of them with indefinite locality ("Tehuantepec") has the tail little darker than the rest of the body, and distinctly mottled and banded; the whole body is a little lighter than in the others. This may be a juvenile *unicolor*, although the distinct lateral black marks on the belly do not so indicate. It furthermore may represent an intergrade between *unicolor* and *rubidus* (*rubidus-melanocercus*), but in view of other evidence that such intergradation does not occur, it is not well to draw conclusions upon the basis of this juvenile in which adult features are not evidenced.

The other three specimens appear to be typical intergrades (as characterized by the adults), with the exception that about half the ventrals have a black lateral streak, as typical of adult *rubidus*. The same marks, however, are indicated in the adult *rubidus-melanocercus* intergrades, although poorly defined. Presumably sharp definition of them is a juvenile characteristic in the intergrades; in typical *rubidus* they are sharply defined in the largest adults as well.

***Drymarchon corais orizabensis* (Dugès)**

*Morenoa orizabensis* Dugès, Proc. Zool. Soc. London, 1905: 517–518, fig. 77.

*Type locality*.—Orizaba, Veracruz.

*Diagnosis*.—Adults entirely black above; most of sides of head black; anterior portion of belly heavily pigmented, less than half anterior third light; remainder of ventral surface black; light areas on belly white or cream, not pink; ventrals 186 to 201, caudals 71 to 78. Antepenultimate labial in contact with temporal or postocular or both (rarely not); scale rows rarely reduced to 14 in front of anus.

*Range*.—Atlantic slopes from near the Isthmus of Tehuantepec about to Mirador, Veracruz. Perhaps restricted to the foothills.

*Specimens examined*.—Five typical specimens were examined: the type, in the museum at Guanajuato, Mexico; U.S.N.M. no. 110886 and EHT-HMS nos. 5368, 5592–3, all from Potrero Viejo, Veracruz; and U.S.N.M. no. 24999, Mirador, Veracruz.

*Remarks*.—The type is a juvenile; its association with the very black adults from the same area is prompted for geographic reasons. The form is most nearly like *rubidus*, from which it differs in having the belly almost entirely black (much as in *couperi*), and the light ventral areas not red but white or cream. Its similarity to *rubidus* does not necessarily mean that it is more closely related to that form than to any other. There is evidence that the two are of independent origin.

TABLE 6.—SCALE COUNTS IN ORIZABENSIS

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
5368	♀	201	71	17–15	8–8	Contact
5592	♂	192	64+	17–15	8–8	Contact
5593	♂	186	71	17–15	8–8	Contact
24999	?	195	—	—	8–8	Contact
110886	♂	193	76	17–15	8–8	Contact
Type	♂	199	78	17–15	7–8	Contact

Intergradation between *melanocercus* and *orizabensis* is demonstrated by a series of four specimens bearing the locality data Mirador, Veracruz (nos. 25000–3). Two of these are adults; they have the head and the anterior half of the body peculiarly mottled with jet black on a brown ground color; the posterior third of the dorsum is entirely jet black, the tail black above and below; most of the labials are black-edged. This condition is certainly intermediate between that of *melanocercus* and *orizabensis*. The two young are similar, except that light bands are evident on the anterior portion of the body; the bands are broad, covering about two scale lengths, as in *melanocercus*.

It is to be noted that both typical *orizabensis* and typical *melanocercus* occur near this locality, if the data on two specimens, presumably from the environs of Mirador, can be trusted (no. 25093, *melanocercus*; no. 24999, *orizabensis*). Both these specimens are unquestionably identifiable, even though one (*melanocercus*) is a juvenile.

Upon the evidence of these data, and also because an intergrade of *melanocercus* and *erebennus* is available from farther north, it appears reasonable to assume that *melanocercus* is typically a plains species, while *orizabensis* must be restricted to the extensive area of forested foothills in central and

southern Veracruz, from which all specimens with positively known locality data have been taken.

TABLE 7.—SCALE COUNTS IN ORIZABENSIS-MELANOCERCUS INTERGRADES

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
25000	♀	199	—	17-15	8-8	Contact
25001	♂	196	74	17-15	8-8	Contact
25002	♂	190	72	17-15	8-8	Contact
25003	♀	191	72	17-15	8-8	Contact

### *Drymarchon corais erebennus* (Cope)

*Georgia obsoleta* Baird and Girard, Cat. N. Amer. Rept., pp. 158-159. 1853.

*Spilotes erebennus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 1860: 342 (substitute name for *Georgia obsoleta* Baird and Girard); *idem*, p. 564.

*Coluber corais* Boulenger (part), Cat. Snakes Brit. Mus. 2: 31, 1894. (suppresses *Coluber obsoleta* [Baird and Girard], as a homonym of *Coluber obsoletus* Say, making available *erebennus* Cope).

*Type locality*.—Eagle Pass, Texas.

*Diagnosis*.—Black above posteriorly, becoming spotted or banded on middle

TABLE 8.—SCALE COUNTS IN EREBENNUS

Number	Sex	Ventrals	Caudals	Scale rows	Supra-labials	Antepenultimate labial
A656	♂	189	63+?	17-14	8-8	Contact
1843	♂	189	61	17-14	8-8	Contact
1859	♂	184	59	17-14	8-8	Contact
1862	♂	—	55	17-14	8-8	Contact
1860	♂	186	56+?	17-14	8-8	Contact
15675	♀	186	60	17-14	8-8	Contact
15872	♀	191	65+	17-15	8-8	Contact
16142	♂	183	—	17-15	8-8	Contact
25200	♂	186	65	17-15	8-8	Contact
26439	♀	193	57	17-14	8-8	Contact
32783	♂	183	—	17-14	8-8	Contact
37515	♂	188	59	17-14	8-8	Contact
65165	♂	186	55	17-14	8-8	1 side
82564	♂	188	—	17-14	8-8	1 side
105307	♂	186	—	17-14	8-8	Contact
105308	♂	183	—	17-14	8-8	Contact
110866	♀	192	—	17-15	8-8	Contact
110867	♂	192	—	17-14	8-8	Contact
110868	♀	188	62	17-14	8-8	Contact
110869	♂	187	58	17-14	8-8	Contact

and anterior part of body in adults; subcaudals less than 68 (55 to 65); antepenultimate labial in contact with temporal or postocular or both; scale rows near anus usually 14.

*Range*.—Central southern Texas south to extreme northern Veracruz and central Hidalgo.<sup>3</sup>

<sup>3</sup> The specimen from Tasquillo, Hidalgo, described by Martín del Campo (Anal. Inst. Biol. Mex. 8: 264-265 1937) is obviously of this subspecies. Apparently the form extends up the valleys of the Panuco river system, to which the Río Tula that flows by Tasquillo belongs. On maps the spot appears well within the plateau of Mexico.

*Specimens examined*.—Twenty, from the following localities: HIDALGO: Km. 332, 5 kilometers south of Chapulhuacán (no. 110868). VERACRUZ: Tuxpán (no. 25200). SAN LUIS POTOSÍ: Huichihuayán (no. 110869). TAMAULIPAS: Hda. La Clementina, 4 miles west of Forlón (nos. 105307-8, 110866-7; EHT-HMS no. 15872); Matamoras (no. 1859). COAHUILA: Sabinas (no. 37515). TEXAS: Brownsville (nos. 1860, 32783); Lower Rio Grande (no. 1843); San Diego (no. 15675); Eagle Pass (no. 1862, type); Cameron County (no. 65165); McAllen (no. 82564); Las Moras Springs, Kinney County (no. 26439); 29 miles north of Brownsville (Kans. Univ. no. 16142); no locality (EHT no. A656).

*Remarks*.—This subspecies is well differentiated from all others, having a unique character in usually possessing 14 scale rows near the anus; it differs from all others except *couperi* in having less than 68 caudals.

An intergrade between this subspecies and *melanocercus* is represented by No. 46447 from Metlatoyuca, Puebla (extreme northeastern corner). The coloration of the specimen is exactly typical of *melanocercus*, but the scutellation is that of *erebennus*: scale rows 17-14; ventrals 186; caudals 63; supralabials 8-8; antepenultimate labial in contact with temporal; female.

 TABLE 9.—SCALE COUNTS IN *COUPERI*

Number	Sex	Ventrals	Caudals	Scale rows	Supralabials	Antepenultimate labial
4457	♂	185	66	17-15	7-8	Separated
4458	?	—	—	—	7-8	Separated
4504	♀	186	63	17-15	8-8	Separated
10379	♂	186	67	17-15	8-8	Separated
10465	♀	195	64	17-15	8-8	Separated
10790	♂	188	65	17-15	8-8	Separated
10824	♀	193	64	17-15	8-8	Separated
14842	♂	187	66	17-15	7-8	Separated
18514	♂	187	64	17-15	8-8	Separated
24605	♂	187	65	17-15	8-8	Separated
26618	♂	187	65	17-15	8-8	Separated
36481	♂	186	67	17-15	8-8	Separated
37354	?	—	—	—	8-8	Separated
38101	♂	185	67	17-15	7-8	Separated
38153	?	—	—	—	7-8	Separated
38367	♀	193	63	17-15	8-8	Separated
38579	♂	189	—	17-15	7-7	Separated
38683	♂	187	—	17-15	8-8	Separated
44187	♂	187	—	17-15	7-8	Separated
44519	?	—	—	—	7-7	Separated
61218	♂	186	—	17-15	8-8	Separated
83317	♂	187	67	17-15	8-8	Separated
85307	♂	187	—	17-15	8-8	Separated
85308	♂	189	64	17-15	8-8	Separated
85309	♂	185	66	17-15	8-8	Separated

In color, the subspecies perhaps most easily confused with *erebennus* is *rubidus*; the latter, however, has the back uniform black in adults, and is not spotted anteriorly on dorsal surface; also, the light areas on the lips are white or pink, sharply differentiated from the black (brown in *erebennus*).

#### *Drymarchon corais couperi* (Holbrook)

*Coluber couperi* Holbrook, N. Amer. Herp., ed. 2, 3: 75, pl. 16. 1842.

*Drymarchon corais couperi* Stejneger and Barbour, Check List N. Amer. Amph. Rept., ed. 2, p. 93. 1923.

*Type locality*.—Dry pine hills south of Alatomaha, Ga.

*Diagnosis*.—Adults uniform black above and below, except gular region; caudals less than 68; antepenultimate labial separated from temporal or postocular by contact above it of adjacent labials; 15 scale rows in front of anus.

*Range*.—South Carolina to Florida, westward to southern Louisiana (Stejneger and Barbour).

*Specimens examined*.—Twenty-five. FLORIDA: Silver Springs (Kans. Univ. no. 18514); Lemon City (no. 38153); Kissimee River (no. 36481); West Palm Beach (no. 37354); Gainesville (nos. 10465, 10790, 10824, 14842); Orlando (nos. 26618, 83317); Norwalk ? (nos. 38367, 38683); Clearwater (no. 10379); Pinecrest (nos. 85307–8); Canaveral (no. 44519); Miami (no. 85309); "Florida" (nos. 44187, 24605, 38101, 38579, 61218). GEORGIA: Brunswick (no. 4504); Liberty County (nos. 4457–8).

*Remarks*.—The existence of a hiatus between the ranges of *couperi* and *erebennus* makes questionable the status of these two as subspecies of the same form. The eastern subspecies, however, is so obviously a derivative of *erebennus*, and their characters in general are so similar, that their relationship is probably best expressed as the name has been used in the past.

This subspecies is the most highly modified of the whole genus. It has a completely evolved, terminal type of color pattern (all black, shared with *orizabensis*), insofar as the trend toward complete melanism is concerned. In addition it possesses three modifications in scutellation, while only one or two modifications occur in other members of the genus: (1) Reduced caudals (shared with *erebennus*); (2) antepenultimate labial separated from temporals and postoculars (unique, almost invariable); and (3) reduction of supralabials to 7 (unique, but in only 20 percent of the counts). Of course, there are changes observable in ventral counts in the various forms of the genus, but the trend in general is so gradual from north to south or vice versa that no one form can be credited with the development of a unique amount or type of variation in this character.

#### CONCLUSIONS

A number of problems made evident but not solved by the present study may be listed:

1. The existence of other forms, particularly of types more melanistic than *corais*, is to be looked for in South America.

2. The question of intergradation between *corais* and *melanocercus* in South America is still open. Theoretically there should be no intergradation between them, although Amaral (*op. cit.* p. 328) states that "Certain examples from Colombia appear intermediate between *corais* *corais* and *corais melanurus*."

3. The exact ranges of *melanocercus* and *unicolor*, and the areas of intergradation between them, are yet to be determined.

4. The apparent lack of intergradation, and overlapping of ranges, of *unicolor* and presumed intergrades between *melanocercus* and *rubidus* in southern Chiapas, need verification.

5. There is some evidence that the presumed intergrades between

*rubidus* and *melanocercus* may be recognizable as a different subspecies, even though its characters undoubtedly have arisen through hybridization between these two forms. Suggestive of this are two specimens from Achotal, Veracruz, in Field Museum of Natural History: one is typical *melanocercus*, the other a typical *melanocercus-rubidus* intergrade; both are adults.

6. The possible split of *melanocercus* into two subspecies should be settled by examination of Honduras and Nicaragua specimens; it is barely possible that *unicolor* extends completely across Nicaragua, in which case an actual separation of a northern and southern population of *melanocercus* is evident.

7. The exact range of *orizabensis* is yet to be defined.

8. The apparent existence of *melanocercus* on the plains of Veracruz north of the Isthmus, indicated by several intergrades between that form and *orizabensis* and *erebennus*, should be verified.

9. The apparent hiatus between the ranges of *erebennus* and *couperi* should be investigated. If these two forms are proved to be separated from each other geographically, their rather sharply different morphological and pattern characters suggest the possibility of considering *couperi* a distinct species.

ZOOLOGY.—*A new brittle-star of the genus Ophiocomella from Canton Island.*<sup>1</sup> AUSTIN H. CLARK, U. S. National Museum.

The genus *Ophiocomella* was diagnosed in 1939 with the type species *O. caribbaea*, a small 6-armed form that previously had been considered as the young of *Ophiocoma pumila*. The species assigned to the genus were *Ophiocomella caribbaea*, sp. nov., *O. parva* (H. L. Clark), *O. schmitti*, sp. nov., and *O. clippertoni*, sp. nov. (the last a tentative name for specimens from Clipperton Island doubtfully referred to *O. parva*). The discovery of another species of this curious genus is a matter of considerable interest.

*Ophiocomella schultzi*, sp. nov.

*Description.*—The disk is circular, not notched at the arm bases, slightly elevated, 4.3 mm in diameter; the six rather slender arms are 17 mm long; the arms are separated by about three times their basal width. The specimen is sexually mature.

The aboral surface of the disk is covered with fine, overlapping, conspicuously punctate scales. About one-quarter of these scales bear short roughened cylindrical spinelets, which are about twice as high as thick with low-conical or rounded tips. These are rather widely spaced, being usually two to four

<sup>1</sup> Published with the permission of the Secretary of the Smithsonian Institution. Received June 22, 1941.